

- Fig. 7-9. *Emberiza luteola*, p. 109.
 „ 10. — *spodocephala*, p. 109.
 „ 11. — *cinerea*, p. 109.
 „ 12. — *spodocephala*, p. 109.
 „ 13. — *stracheyi*, p. 110.
 „ 14. — *stewarti*, p. 110.
 „ 15. — *stracheyi*, p. 110.

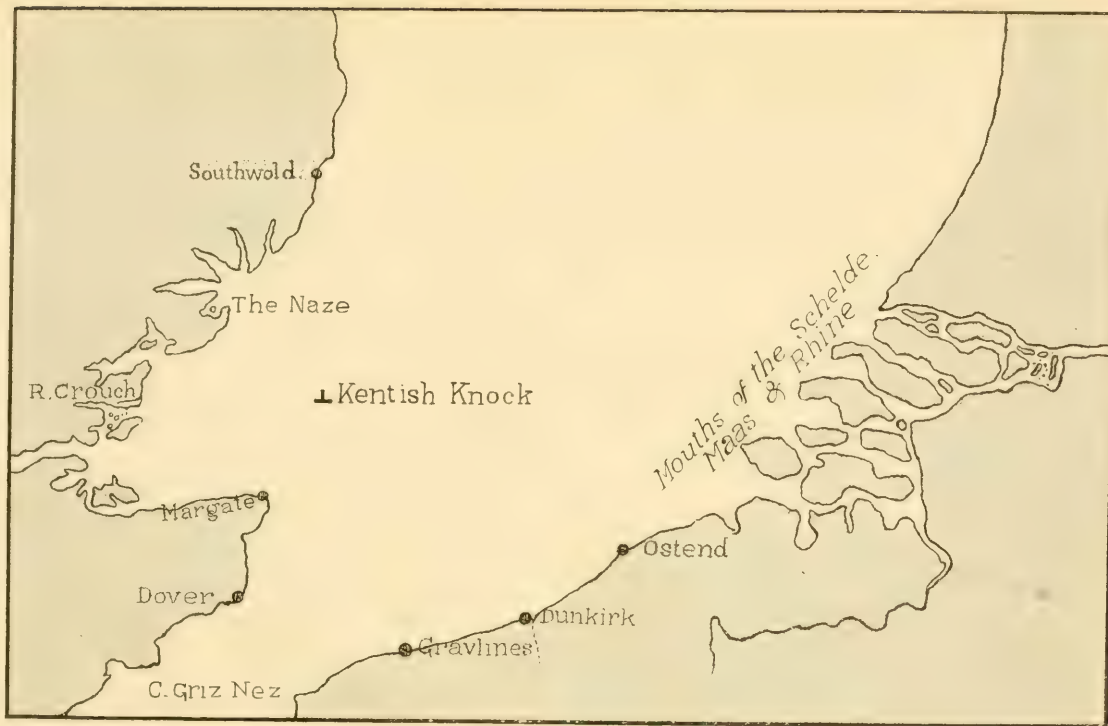
IX.—*Studies in Bird-migration. II. The Results of Observations made at the Kentish Knock Lightship in the Autumn of 1903.* By WILLIAM EAGLE CLARKE, F.R.S.E., F.L.S.

(Plate IV.)

AMONG the most interesting of the varied movements of birds observed in the British Isles are those remarkable intermigrations which take place in spring and autumn between the south-eastern coast of England and the opposite shores of the Continent, and mainly come under notice at the numerous lightships stationed between the mouth of the Humber and the Straits of Dover.

If not actually a discovery resulting from the investigations of the Migration Committee appointed by the British Association, it is assuredly due to the labours of that body, and especially those of the late Mr. John Cordeaux, its Secretary, that attention was first prominently drawn to these important flights across the southern waters of the North Sea. To those investigations we owe most of our present knowledge regarding such movements.

During the preparation of the "Digest of the Observations on the Migrations of Birds made at Lighthouses and Lightships, 1880-1887," it became evident to me that much remained to be learned concerning these movements and the various conditions under which they were performed, and I conceived the idea of undertaking some researches regarding them. To accomplish this, however, it was essential that I should spend some weeks on one of the lightships—a course which demanded some consideration, since life on one of these floating observatories presents discomforts which are peculiarly its own. Encouraged, however, by the



MAP SHOWING THE POSITION OF THE KENTISH KNOCK LIGHTSHIP.

experience gained at the Eddystone Lighthouse in the autumn of 1901, I decided to make the venture, and an application was forwarded for me by the Royal Society to the Trinity House for permission to spend a month during the past autumn on one of the Corporation's lightships in the North Sea. This privilege was graciously granted, and every facility was offered for visiting any vessel that might be selected.

The selection of a suitable station demanded careful consideration, and I finally decided upon the Kentish Knock Lightship. This vessel appeared to me to lie at or near the centre of the migratory stream that I desired to investigate, and its remote situation out of sight of land to afford an excellent opportunity for witnessing the various movements, and the conditions under which they were performed, free from the influences which might prevail at stations nearer to our shores; lastly, the character of its light seemed to be especially adapted for attracting the migrants which might pass in the night.

The geographical position of the lightship will be best realised by a reference to the accompanying map (Plate IV.) which shews its situation in relation both to the English shores and those of the Continent. It is stationed in latitude $51^{\circ} 38' 50''$ N., and in longitude $1^{\circ} 39' 55''$ E., lying 21 miles N.E. by N. of Margate, and 21.5 miles S.E. of the Naze, which are respectively the nearest points of land, while it is moored two miles east of the extensive sand from which it takes its name—a sand entirely submerged at all states of the tide. The following table (p. 114) affords some further information regarding its geographical relations.

The vessel is equipped with a white revolving light, throwing out three beams each of 12,000 candle-power, and making a complete revolution in three minutes. As it lies in the direct course of all the east-coast traffic passing north and south *viâ* English Channel, it is furnished with an extremely powerful siren for use in times of fog or haze.

Life on a lightship is undoubtedly one of considerable hardship and discomfort. It is the life of a seaman spent

Direction from Kentish Knock.	Points struck on the English and Continental Coasts.	Miles from Kentish Knock.
North.	A little south of Southwold on the Suffolk coast	49
N.N.W.	Mouth of River Deben on the Essex coast	42
N.W.	The Naze on the Essex coast	21·5
West.	S.E. coast of Essex near the mouth of the River Crouch	31
S.W.	North coast of Kent near Reculver. .	28
S.S.W.	East coast of Kent.	21
South.	North coast of France a little E. of Cape Gris Nez	53
S.S.E.	Gravelines, on the N. coast of France	48·5
S.E.	Belgian coast near to the frontier of France.	56
East.	Mouth of the East Schelde, coast of Holland	88

under the most trying conditions, namely, one whose ship is ever the sport of the winds and waves. I enjoyed the best of health while on board, and the almost incessant watchfulness necessary for the successful prosecution of my work rendered my sojourn free from that tediousness which is usually inseparable from residence in such vessels.

I sailed from Blackwall in the Trinity tender 'Vestal' on the morning of the 15th of September, and, after visiting the various lightships and "pile" lighthouses within the Thames Estuary, and the outlying Galloper Lightship, was placed on board the Kentish Knock Lightship at noon on the 17th of September, and remained there until the 18th of October.

I found the bird-migration at the Kentish Knock of a very varied and complex nature, in which respect it is probably not surpassed by any other station on the British coasts. The ship lies about the centre of a broad junction where many lines of flight cross. Here, in addition to (1) the extensive movements (I speak of those of the autumn, the spring migrations being in an opposite direction) of Immi-

grants from E. to W., there are (2) movements of a similar nature from S.E. to N.W., and (3) of Birds of Passage along both these lines of flight; while (4) Emigrants pass from N. to S.S.W., and (5) from N.W. to S.E.; and, lastly, (6) many Birds of Passage also proceed from N. to S.S.W. There appeared to be no Continental migration whatever from points north of east. It will thus be realised that much "cross migration" takes place, and this, too, on the part of identical species, sometimes performed, strange to say, on the same day and even at the same hour. Another feature of importance is that at the Kentish Knock and neighbouring lightships the day movements equal if they do not surpass in magnitude those observed during the night, whereas at other stations around our coasts the nocturnal movements much exceed in extent those occurring during the day.

As at the Eddystone in 1901, I found it extremely difficult to detect small birds during the day-time. The vast majority—nearly all of them, in fact—fly close to the water, and the waves, always in motion, form a most unsatisfactory background against which to pick up migrants, unless they are passing in large flocks. The rougher the sea the more difficult is the task of observation, and the higher the wind the more closely do the birds hug the surface of the sea; thus, except during a dead calm, many migrants escape notice in spite of the utmost watchfulness on the part of the observer.

In connection with the movements witnessed at such isolated stations, it must be remembered that these observatories are mere specks in the open sea, and the marvel is that one sees so much, especially during the day-time. At night it is somewhat different, for then, under certain atmospheric conditions, numbers of birds are attracted to the lantern—many of them, no doubt, being allured from afar.

In the preparation of these results I have grouped the observations under the particular set of movements or problems to which they relate, reserving certain information to be dealt with under the various species.

The first migratory movements to come under notice were those proceeding in a southerly direction. I was much gratified to find that, although at such an outlying station, the lightship lay in the course of the southerly passage of numerous summer-birds departing either from the more northern Counties of Great Britain, or from North-western Europe *vid* our eastern seaboard, or, again, from both these areas. Many of these migrants from the north while skirting our shores find themselves far to the eastward on reaching the coast of Suffolk, and on leaving that county proceed over sea towards the east coast of Kent, a course which carries them near to the Kentish Knock, where not a few of them were observed coming from the N. and proceeding to the S.S.W.

Numbers of such emigrants passed between the 18th and 29th of September—a genial spell of weather, with much sunshine and light breezes, following a particularly cold and stormy period for the time of the year. Between these dates many Wheatears, Redstarts, Skylarks, Pied Flycatchers, and Tree-Pipits flitted by; and fewer Meadow-Pipits, Starlings, Golderests, Pied Wagtails, Yellow Wagtails, and Swallows, all *singly* except the Skylarks and Swallows, which passed in small parties. These migrants not unfrequently followed each other in quick succession, but there were usually greater or lesser intervals between their appearances. Not a few alighted on the ship, most of them appearing somewhat mysteriously, for, as a rule, they escaped notice until they perched upon the rail or rigging. Some of these visitors were both tired and hungry and spent a considerable time with us, busying themselves in an active search for insects, of which we had numbers on board at the time*. Others remained for a few moments only and then took their departure. In all cases the birds on leaving the ship winged their way towards the coast of Kent †.

* For an account of some of the insects observed on the Kentish Knock Lightship, see the 'Entomologist's Monthly Magazine' for December 1903, p. 289.

† Sept. 19th was a great day for migrants (probably most of them

No doubt many birds of the species named and others passed without coming under notice, for a very slight deviation to the east or west would carry them beyond the range of observation. Among the rarer species observed were an Icterine Warbler and a Blue-headed Wagtail.

These southerly movements were by no means confined to the day-time, but were in progress during much of the night, and on each occasion on which the conditions were suitable for their observation during the period named they came under notice. All the species already named (excepting the Wagtails), with the addition of Common Whitethroats, Spotted Flycatchers, Thrushes, and Blackbirds, were observed around the ship, sometimes for several hours and in great numbers; and at 3 A.M. on the 25th September a Richard's Pipit was captured at the lantern. Common Sandpipers were heard passing on one occasion, but did not shew themselves in the rays.

I have not thought it necessary, in dealing with these September emigratory and passage movements, to treat of the night-movements apart from those witnessed during the day, for there can be no doubt as to their precise nature.

A Phalarope, probably *Phalaropus hyperboreus*, was observed on the water some little distance from the ship on the 13th of September. It was one of the very few Linnæoline birds that came under observation, and was the only one detected during the day-time.

These movements of summer-birds departing southwards were prolonged beyond the limits of September. Thus Wheatears and Chiffchaffs were observed on the 3rd of October; Starlings, Chaffinches, and Swallows passed on the 13th, Sand-Martins on the 15th, and Swallows again on the 16th.

immigrants from N.W. Europe) on the coasts of Lincolnshire and Norfolk where, as I am informed by Mr. Gurney, Redstarts, Pied Flycatchers, Redbreasts, Goldcrests, Ring-Ouzels, Lesser Whitethroats, Bluethroats, Blackcaps, and Grasshopper Warblers occurred. On the same day Redstarts, Pied Flycatchers, Wheatears, Willow-Warblers, and Tree-Pipits were passing S.S.W. during the afternoon at the Kentish Knock.

Here, too, may be mentioned the Rock-Pipits observed on the 23rd of September and on the 8th and 12th of October.

The day-movements were chiefly observed during the forenoon, but on some occasions were continued until sunset; while the hour and duration of the nocturnal visits entirely depended upon the advent and prevalence of weather conditions suitable for bringing night migration under observation.

Continuing the observations relating to emigration, I have next to notice a series of movements from the N.W. towards the S.E., that is to say, from the Essex coast at or about the Naze to the Belgian coast near the French frontier—a line of migration which seems to have been overlooked, but one to which I have recently drawn attention when treating of the spring-migrations, in the reverse direction, of the Rook and Starling (see Rep. Brit. Assoc., Southport Meeting, 1903). The emigrations observed along this route, though marked, were confined to a few species, and it formed the main line across this part of the North Sea by which the House-Martin, Meadow-Pipit, and Pied Wagtail sought the south, and was also a minor route for Wheatears, Starlings, and Skylarks. Considerable numbers of the three first-named species traversed it on the 7th, 9th, and 14th of October, days on which there was little or no migration along other lines of flight.

We now approach the east to west flights, which are certainly the most interesting of the migrations observed on this section of our coast-line, and are also the main diurnal movements regularly witnessed on the British shores.

The Kentish Knock Lightship, I found, occupied a central position amid this great feathered stream, since the vast majority (90 per cent. or more) of these migrants were moving direct from E. to W. On the Norfolk coast their chief line of flight is to the N.W., on the Lincolnshire coast to the N.N.W., while on the east coast of Kent it is to both W. and S.W. On certain days, when general movements are in progress, these flights have often been known

to cover the entire coast-line between the Humber and the Straits of Dover.

On arriving on our shores many of these immigrants proceed inland and settle down for the winter, while others traverse the south coast and cross St. George's Channel to winter in Ireland; others, again, cross the English Channel *en route* for Southern Europe.

Owing, perhaps, to the unexpected spell of summer weather that characterised the latter half of September and to the high and uniform temperatures which prevailed then and during the first week of October, the east to west movements of the autumn of 1903 were very slightly in evidence in the earlier days of my residence on the lightship. During the period indicated only a few Skylarks, Tree-Sparrows, Swallows, Meadow-Pipits, and single Starlings were seen. The night movements of Waders and other Limicoline species, however, appeared to be of more importance; but, alas! only the notes of Ring-Plovers and Lapwings could be identified among the many voices that reached me as the migrants sped westwards under the cover of darkness.

The first extensive movement immediately followed a decided fall in temperature on the Continent. This commenced at 9 A.M. on October 8th, and from that hour until 2 P.M. flock after flock of Skylarks and Chaffinches and small parties of Tree-Sparrows and Meadow-Pipits followed each other in rapid succession. Starlings, which had hitherto only been noted singly, also passed in small troops. It was an important morning for E. to W. migration, and not only did hundreds of birds pass quite close to the ship, but far greater numbers, in fact many thousands, were observed pursuing a like course at distances too great to render their identification certain, especially amid the dull weather and heavy rain which prevailed, and from the fact that all were flying close to the surface of the sea.

On October 10th there was another considerable fall in temperature, and our thermometer registered 10° lower than on any previous occasion since my residence on the lightship; this was followed on the 11th by the greatest diurnal

movement of birds that I have ever witnessed. It set in at 8 A.M. with a conspicuous passage of Starlings, Skylarks, and Tree-Sparrows. By midday it had assumed the nature of a "rush," which was maintained without a break until 4 P.M. It was a remarkable movement in many ways. Skylarks, Starlings, Chaffinches, and Tree-Sparrows not only passed westwards in continuous flocks, but many of these companies consisted of hundreds of individuals. So numerous were the Starlings composing some of these bands that when first observed in the distance they resembled dark clouds, and formed a conspicuous contrast to the leaden, white-crested, billows. The elements contributed to the singularity of the scene. The weather, which had been fine up to 9 A.M., rapidly changed, and by noon it had become, in nautical parlance, a "dirty day"—a character which it maintained to the end. The rain, which fell steadily at first, became a downpour, and finally torrential. Indeed, so rain-laden did the atmosphere become that it was necessary to sound the fog-horn, the hideous yells of which added a weird accompaniment not out of harmony with a scene which, apart from its interest to a naturalist, was dismal in the extreme. The wind, too, had been gradually rising, and by 3 P.M. had increased to a "strong breeze" with a velocity of 34 miles an hour. There were squalls at intervals which lashed the rain against one's face with such violence as to cause the skin to tingle for a considerable time. How the migrants braved such a passage was truly surprising. How they escaped becoming waterlogged in such a deluge of wind-driven rain was a mystery. Yet on they sped, hour after hour, never deviating for a moment from their course, and hugging the very surface of the waves, as if to avoid as much as possible the effects of the high beam wind. It was surely migration under the maximum of discomfort and hardship, indeed under conditions that approached the very verge of disaster for the immigrants.

It is probable that the birds would not have quitted the Continent had these later conditions prevailed at the hour of their departure. That they did not do so is made clear

by a reference to the "Daily Weather Chart" issued by the Meteorological Office, and also by the observations registered at the lightship. The fact is that the weather changed rapidly under a falling barometer and a southerly wind; and thus, although the migrants set out under favourable conditions for the passage, they were overtaken while *en route* by the changes which became more and more unfavourable as they neared the English coast, and at the same time approached more nearly the storm-centre which lay off our own western shores. Thus were they trapped, and had to make the best they could of a bad passage.

There were also westward flights of considerable magnitude on the part of the same species on the following day, October 12th, and again on the 15th. These were performed under conditions which were not unfavourable to the migrants. On the latter date some remarkable cross-migrations were observed on the part of Skylarks and Chaffinches, flocks of which were passing to both S.S.W. and W., sometimes simultaneously, during the morning.

On the 17th of October Skylarks and Starlings were passing W. at intervals during the day, in spite of a somewhat high northerly wind. Late in the afternoon the first Rooks and Jackdaws appeared in small numbers, as they did also at the Galloper Lightship, a vessel moored over thirteen miles to the E.N.E. of us. The advent of these birds was of great interest to me, for I had been expecting them for some time. Several individuals of each species appeared at 4.30 p.m. and alighted on the ship, but did not remain long ere they departed westward. At 6.30 p.m., in continuance, no doubt, of the movement referred to, several Rooks and Jackdaws appeared at the lantern and flew around for some hours, indeed until daybreak the following morning, one adult Rook and two Jackdaws having been captured. A great number of Starlings, Skylarks, Chaffinches, Mistle-Thrushes, Song-Thrushes, Goldcrests, Meadow-Pipits, Wagtails, and doubtless other Passerines, were also present at the time.

The 18th added some interesting experiences. The "relief" at the Kentish Knock Lightship was effected by

the Trinity Yacht 'Irene' at 9 A.M. A great westerly movement was in full swing at the time, under weather conditions which were eminently favourable to the migrants—the usual species, namely Starlings, Skylarks, Chaffinches, and Tree-Sparrows. At 10.30 A.M. we bid adieu to the Lightship and steamed south-west towards the Kentish coast, on nearing which our course was changed and we proceeded west in the direction of the Thames Estuary, and finally to the mouth of the river, where, at 3 P.M., I was put ashore at Southend.

During the entire passage of four and a half hours—the distance travelled being close upon fifty miles—we were at first crossing the course of, and afterwards running parallel to, the flight of continuous flocks of Starlings and Skylarks, and of fewer Chaffinches and Tree-Sparrows, all proceeding westwards, and all flying low over the calmest of seas in the finest of weather.

These flocks, especially those of the two first-named species, were never absent from view, and we must have encountered tens of thousands of the birds during the passage. It was a revelation even to one familiar with the voluminous records of such movements chronicled in the migration schedules; but it is one thing to study in cold blood, as it were, masses of statistics, and quite another to witness these bird-streams actually flowing before one unceasingly hour after hour. It was the marvellous continuity and apparently inexhaustible nature of these movements that was a revelation to me, both on this and other occasions.

The flocks ceased to be so numerous as we approached the mouth of the Thames proper, but groups of Starlings and Skylarks were still moving westwards when I left the 'Irene,' and at 4 P.M. Skylarks were trooping past in small parties at Southend.

A Mistle-Thrush, observed flying somewhat high and to the west soon after we left the Kentish Knock, was the only Thrush that came under my notice during the day-time.

In addition to the species named as participating in the

great diurnal movements I have endeavoured to describe, Swallows and Martins in considerable and Wheatears in lesser numbers were also observed moving westwards. The fact that these species proceed along this route in autumn is the clearest possible evidence, if such were necessary, that it is also a true passage fly-line for emigrants proceeding from the Continent to their winter-quarters south of the British Isles. These birds of passage after arriving in South-eastern England sooner or later take their departure from our southern shores, *en route* for Africa in some cases and South-western Europe in others. On some occasions small numbers of all the species mentioned as migrating from E. to W. were observed proceeding from S.E. to N.W., but this was exceptional and the movements were never important.

It will have been noticed that the species recorded as participating in these great E. to W. movements are comparatively few in number. This, I think, may be accounted for by the fact that at present our knowledge regarding them is practically confined to what has been observed during the day-time. At the Eddystone, likewise, a few species only crossed the Channel by day, but in great variety at night. May not the same be the case at the Kentish Knock? I am inclined to think that we have here the true explanation of the situation. The phenomena of migration as witnessed at this station are, however, exceedingly complicated, as has already been stated, and it was found impossible to determine from actual observation whence came the birds that were so abundantly noticed during the hours of darkness. I shall return to this subject anon when discussing the night-movements.

The reason why the movements of these species are performed so largely during the day-time, instead of entirely at night as in the case of most over-sea migrations, appears to me to be due to the comparative shortness of the passage. The few hours necessary for its accomplishment would not interfere unduly with the time that must be devoted to the daily search for food—a most important consideration for all migrating birds.

It is a fact worthy of mention that each of the flocks, great and small, that came under observation during these great cross-sea movements was composed of a single species. I never saw a flock or party consisting of mixed species—each kind kept strictly to itself, even when passing simultaneously with others and moving in the same direction.

An interesting problem in connection with these E. to W. movements is: Whence came these vast hosts of autumn migrants—continental emigrants? I was somewhat uncertain when I prepared the "Digest" in 1896. Now I am decidedly of opinion that they are birds of Central (Western) European origin. I have little doubt of this from their lines of flight, from their species, &c. These migrants, I believe, quit the Dutch coast at the mouths of the Maas, Rhine, and Schelde, which they have reached mainly by pouring down the courses of these great rivers from inland districts, some of which lie far away. This would account for the vastness of their numbers.

The extraordinary persistency with which these hosts follow definite lines of flight during their passage across the North Sea is very remarkable and also bears out my view. Thus at lightships lying only a few miles off the coast, and well within sight of land, the birds are *not* recorded as making for the nearest points of the land, though they must be tired after their long passage, but as persistently following particular lines of flight. It is quite reasonable to suppose that the same definite course has been maintained during the entire journey; and if we trace such lines back to the shores of the Continent, we shall find, whether the observation be made off the coast of Lincolnshire or Kent, that they have their origin on that section of the coast of Holland which I have indicated.

The night-movements were of a varied and interesting nature and occasionally of considerable magnitude. Some of them were not difficult to interpret, while others were problematical.

I may say at once that, so far as direct observation was

concerned, it was on all occasions quite impossible to tell from what quarter the birds approached the ship after darkness had set in. This I much regretted, for I was particularly wishful to ascertain whether the E. to W. movements were performed during the night as well as the day. I did ascertain beyond a doubt that Rooks, Jackdaws, Lapwings, Ring-Plovers, and a number of wading birds did move in this direction during the night-time, and I think that there is strong presumptive evidence that the great movement on the night of the 17th–18th of October was wholly, or in part, from E. to W.

The nocturnal passage southwards during the latter part of September has already been alluded to, and but little more remains to be said concerning it. On the night of the 18th of September and during the earliest hours of the 19th, Redstarts, Pied Flycatchers, Thrushes, and an adult male Kestrel—a somewhat unusual nocturnal migrant—were at and around the lantern, along with other species unidentified. This was the commencement of a movement southward which was in full swing all the following day.

Soon after midnight on Sept. 20th a large party of Skylarks appeared, accompanied by other small Passerines. A considerable number struck the lantern and fell into the sea, the wind being moderately strong and the ship riding with her beam to it.

At 8.45 P.M. on Sept. 22nd a number of Wheatears arrived and continued to fly around while the sky remained overcast.

On Sept. 25th between 1 and 4 A.M., during light rain, many Wheatears, Redstarts, Pied Flycatchers, Whitethroats, Willow-Warblers, Tree-Pipits, Skylarks, and a Richard's Pipit (all of which were killed at the lantern), doubtless with other species, were flying round the vessel, and great numbers struck the glass and were lost in the sea.

On Sept. 29th, between 2 and 5 A.M., Blackbirds (those killed being immature males), Redstarts, Pied Flycatchers, Wheatears, Goldcrests, and Skylarks were present in great numbers, and hundreds struck the lantern and fell overboard.

On October 3rd, from 1.30 to 4 A.M., Golderests, Mistle-Thrushes, Song-Thrushes, Blackbirds, Chiffchaffs, Meadow-Pipits, Wheatears, and others were flying round. The rays of light were not very brilliant, however, and comparatively few perished at the lantern.

The fortnight that followed was devoid of night-movements. There were days on which much E. to W. migration was witnessed, but the nights were birdless, so far as observation was concerned, for the weather conditions were not such as to render the lantern attractive to passing migrants, if such there were.

From 6.30 P.M. on the night of October 17th to 5 A.M. on the 18th, Starlings, Larks, Chaffinches, Jackdaws (a few), Rooks (a few), Mistle-Thrushes, Song-Thrushes, Wagtails, Golderests, Meadow-Pipits, and probably many other species were careering around the ship, and examples of those named were either killed or captured at the lantern. This was the most important of the night-movements witnessed, for some thousands of birds struck the lantern and fell overboard during the ten-and-a-half hours that it was observed. As to this movement, there is, I think, evidence in favour of its being, in part at least, an E. to W. migration; it commenced as soon as it was dark, and some of the species participating in it, notably the Rooks, Jackdaws, Chaffinches, Skylarks, and Starlings, had been observed moving in that direction down to within an hour or a little more of the first appearance of the birds at the lantern. Thus it may almost be regarded as a continuation of the flights witnessed during the day. The presence, too, of the Rook and the Jackdaw, and the entire absence of any essentially northern species, must be considered as favourable to this view.

These night-movements were very interesting to witness, and were novel to me, since they were seen from an entirely new standpoint—namely, from below. Of these new experiences, perhaps the one which impressed me most was that from the deck of a lightship one realised more fully the terrible loss of life that is involved by these nights at the lantern. Here one saw birds actually falling thickly around,

and even heard them dropping into the water. Such scenes often lasted for hours—ten-and-a-half hours on the 17th–18th October,—and the sacrifice thus caused is simply appalling. Some of the victims, indeed the majority, were only stunned or slightly injured, and thus met with a miserable death at sea. Few fell on board, unless the night was still, and then chiefly those which struck the lantern with considerable force and fell below like stones.

Seen from the deck, the three beams from the lantern appeared to be thrown towards the surface of the surrounding waters at an angle of 45° . The birds—brilliant glistening objects—seemed to ascend, as it were, these streams of light by a series of short jerky flaps performed by wings which appeared to be only half spread for flight. Some of them paused when within a short distance of the lantern, and remaining almost stationary, sunned themselves in the radiance of the slowly passing beam. Others were bolder and approached the light more closely, but ere they reached it spread their tails like fans, as if to check at the last moment their perilous onward course, and then sheered off, returning in a moment or two to repeat the performance. This spreading of the tail was a pretty trait, especially in the Wheatear, with its black-and-white rectrices. Others, again, approached the light gently, and either fluttered against the glass, or, as was particularly the case with the Starling, perched on the iron framework of the lantern-windows and seemed to revel in the light. In this respect the Starling differed from the rest, and when one brilliant beam had passed, the bird craned its neck and appeared to gaze longingly towards that which was slowly approaching. Indeed, the actions of the Starling in particular shewed the birds under the spell of some overpowering fascination. A number of the visitors made their *début* with a wild dash for the light, and these, if they struck the glass direct, were killed outright; while if the contact was made obliquely they glanced off stunned and, slightly injured, descended with a curious zigzag flight which sometimes carried them some little

distance ere they were lost amid the waves. The Rook cut the sorriest figure of all the migrants seeking the light. He, too, tried to obtain foothold on the frame of the lantern whereon to sit amid the blaze of light, but failed and flapped and struggled against the windows in a singularly clumsy fashion. Finally, to complete the scene, there was the singular effect produced by its central feature, namely, the great lantern, which, placed high up on the mast, swung slowly to and fro amid the glittering hosts that danced attendance upon its mystic charms.

On occasions when the rays were not particularly brilliant the migrants flew aimlessly around, passing from ray to ray, sometimes for many hours. It is extraordinary how long some birds will fly round a light without resting. As a good example may be mentioned the case of a Kestrel which appeared at 8 P.M. on the 18th of September, and careered around without a break until 1.30 A.M. on the 19th. This bird often came close up to the light, but checked itself by spreading its tail; and it also frequently flew to windward, and then dashed back over the lantern at a tremendous pace.

When the wind was somewhat high, the birds resorted almost entirely to the lee side of the ship, and approached the lantern head to wind.

Although some of the night-movements witnessed were of considerable magnitude and remarkably prolonged, yet the migrants, on the whole, were singularly silent—indeed, disappointingly so, for thus a useful aid to identification was denied me. A novel method for the capture of specimens for determination was adopted with success, namely, a sailor was stationed on the sloping roof of the lantern, where, armed with an angler's net, he captured the birds, like so many moths, as they streamed up the beams of light towards him. In this way many birds ranging from a Golderest to a Rook were secured for the purpose of identification.

The weather-conditions under which the rays from the lantern became conspicuous and attractive were identical with those I had noted at the Eddystone (see 'Ibis,' 1902,

p. 219), namely, the presence in the atmosphere of moisture not necessarily in the form of rain or haze, but actually present, though not visible, on dark starless nights. In order to put my views on this subject to a scientific test, I took with me to the lightship a hygrometer, with the object of ascertaining the actual percentage of humidity in the air on such occasions. I had not many chances of using the instrument, as either rain or haze was usually present, but on two suitable occasions I found the percentage to reach as high a figure as 86—a more pronounced result than I had anticipated.

There was hardly a single occasion during my visit on which the rays were brilliant and the birds absent; on the other hand, there was not a single instance of migrants visiting the light when the night was bright and starlight or the moon was visible.

The birds which appear at the lantern are, by some authorities, considered to be those that have lost their way, and hence make for the light in default of any other directive impulse. After my experiences at the Eddystone and the Kentish Knock, I am convinced that this is not the true explanation. I believe that the migrants are actually decoyed from or arrested on their course by the influence of the light itself. At the Eddystone the emigrants which I saw in such numbers had barely left the land behind them, and had not had time to get lost when they appeared at the lantern. Another important fact in support of my contention is that the birds never appear at the light-stations at night except when the rays are remarkable for their luminosity; and in this connection it is important to bear in mind that this brilliancy does not depend upon such a thickening of the atmosphere as would cause inconvenience to the birds during their passage, for I have seen them in great abundance at the lanterns when I could make out neighbouring lights that were ten miles or more distant. Another significant fact is that they do not seek stations having red or green lights. Such lanterns, I am informed by the keepers, are seldom if ever visited under any conditions, for, owing to the subdued

nature of their lights, the rays never become sufficiently conspicuous to prove attractive. When the Galloper Lightship had white lights great numbers of birds were allured to its lanterns, but now that the light is red bird-visitors are unknown. If the birds were lost why should they seek a white light and avoid one that is red or green? That the migrants may and do become confused and finally lost after the excitement and fatigue occasioned by their attendance upon the lantern I can well believe.

There is, however, one very remarkable fact concerning these visitors to the lights to which I have never seen any allusion made, namely, that *they are practically all Passerines!* I have seen tens of thousands of migrants around the lanterns of the Eddystone and Kentish Knock stations, and all were Passerines except two, namely, a Storm-Petrel and a Kestrel*. And yet I have heard Waders and other birds passing during these stirring nights at the lantern, though beyond giving tongue they passed by unconcerned and invisible. How are we to account for this? Assuming that the migrants were lost on these occasions, why should Passeres go astray and the Limicolæ pursue their course? Or, as I should prefer to put it, why should the Passeres be allured to the light and not the Limicolæ? Can it be because the former—the most specialized of birds—are rendered by reason of their higher organization more susceptible to the mysterious influence of the light? I merely throw out this suggestion as a possible explanation. I know of no other.

As to the meteorological aspects of the migration-phenomena witnessed at the Kentish Knock, not much remains to be said, for frequent allusions have already been made to them when treating of particular movements. In dealing with this section of the subject, I have consulted a set of the "Daily Weather Reports," issued by the Meteorological

* This is also borne out by the migration statistics from 1880 to the present year. Birds of other orders do appear, but their visits are few and far between.

Office, wherein are shown the conditions prevailing over the whole of the western half of Europe.

The main weather-feature for investigation was naturally that associated with the E. to W. movements. These I find did not set in fully until a decided fall in temperature took place in Western Central Europe, and this important factor was the precursor of each of the pronounced movements observed. Before such incentives to migration were experienced, unusually high temperatures had prevailed, and this was undoubtedly the reason why the movements prior to the 8th of October had been of such a straggling and feeble nature. These falls in temperature were not on all occasions experienced on our shores, and this again demonstrates the necessity for consulting the meteorological data at the place where such movements have their source.

During the great movements from E. to W. the direction of the wind varied from S.E. to N.N.W., and possessed no particular significance. The strongest wind prevailing when I observed migration in progress was on the 13th of October, when, with a westerly moderate gale blowing with a velocity of from 34 to 40 miles an hour, Swallows were proceeding in numbers to the S.S.W., and some House-Martins to the N.W.—no other species being on the move. Under like conditions on the 9th, Martins were the only migrants observed, and were moving from N.W. to S.E.

The weather-conditions under which the other movements were witnessed do not call for any special remarks, for my experiences were similar to those at the Eddystone, and supported the views already expressed in my previous "study" on the bearing of meteorology on bird-migration.

As at the Eddystone, whenever a number of individuals of a species were obtained during any movement they shewed a considerable range of variation in their wing-measurements, bearing out fully what I have previously said on this subject (see 'Ibis,' 1902, p. 267). As shewing how much individuality may enter into these measurements, it is of interest to

note that in six Wheatears, all females in identical plumage, killed or captured on the early morning of September 25th, the range of wing varied from 3·62 to 3·88 inches. It may also be noted that of twenty-two Skylarks obtained on September 29th the wing-range was only from 3·78 to 4·35 for young and old males and females, the average being 4·07 inches; while of ten examples captured on the 17th–18th October it varied from 3·93 to 4·70 inches, the average being 4·3 inches.

The height at which birds fly when migrating is a subject on which much has been written, and the fact that they have been observed proceeding at considerable elevations has been advanced as an explanation of the mystery as to how birds find their way, especially when a considerable extent of sea has to be crossed. That some birds do fly at great heights, and that under certain conditions (which are at present unknown to us) it may be an advantage to them to do so, I will not for a moment deny, but I am convinced that it is not a necessity as a means of finding their way.

The birds observed crossing from E. to W. in the latitude of the Kentish Knock would have a flight of at least 120 miles to perform between the Continental and the English coasts. When observed at that lightship they had over one-fourth of their journey still before them, so that it was an excellent station for witnessing this and the various conditions under which the journey was performed. During all these movements, great and small, the migrants of every species flew close to the surface of the water under all conditions of weather. On certain occasions, notably on the 11th of October, the state of the atmosphere was such that it must have been quite impossible for them to see more than one, or at most two, hundred yards ahead; and yet under these conditions, when it might possibly have been an advantage to fly high, they sped onwards just skimming the crests of the waves, and never departing from a true east to west course. On fine clear days, with a light wind, these flights were performed in a precisely similar manner. Such

facts as these, apart from many others, afford, I think, conclusive evidence that birds are endowed with a sense of direction which, under ordinary circumstances, seldom fails them.

The speed at which birds fly while actually on migration is another moot point on which I was able to obtain some information at this remote station in the North Sea. Speaking generally, the migrants pursued their way at the steady rate characteristic of their respective species. There was no hurry, but at the same time there was a business-like manner about them which was in keeping with the important event on hand. Certain species habitually fly faster than others: thus the flight of the Meadow-Pipit was slower than that of the other species observed; that of the Skylarks, Chaffinches, Wagtails, and others was decidedly faster; while that of the Starlings, Martins, and Swallows was the speediest of all.

I had an excellent opportunity for roughly gauging the speed of both Skylarks and Starlings on the 18th of October from the bridge of the 'Irene,' while running parallel with and in the same direction as the flight of these species. Flock after flock flitted alongside of the ship, and at my request the captain ascertained from the engine-room the precise number of revolutions our twin-screws were making per minute, which gave a speed of exactly eleven knots (12.6 miles) an hour. At this speed the Skylarks passed us with the greatest ease, and, as near as it was possible to estimate, were proceeding as fast again as the ship, or at a rate of about 25 miles an hour, but certainly not more. It was more difficult to say what the speed of the Starlings was, but they were travelling at least half as fast again as the Larks, and therefore at not less than from 35 to 40 miles an hour.

I was much struck with the small number of essentially marine birds that came under my notice at this pelagic station. The only Gulls that were fairly numerous were the Lesser Black-backed and the Kittiwake. The Great Black-backed

Gull was occasionally observed, but only a single Herring-Gull came under notice. Skuas, chiefly Richardson's and a few Pomatorhines, were frequently in attendance on the Gulls. I saw one Tern, an immature example of the common species. There were no Shearwaters, but I saw a single Fulmar. Gannets, all adults, were not uncommon as passing visitors. Common Scoters, Guillemots, and Razorbills were numerous along the edges of the sands, and were chiefly in evidence during the prevalence of strong westerly winds, when they sought our side of the banks—the easterly—for shelter and food. I also saw a few Red-throated Divers.

One of the crew of the lightship who has been on board for over a year and who, being a bird-fancier, knows all the small cage-birds well, informed me that he had never seen a Goldfinch, Linnet, or Redbreast on or about the vessel since he had been stationed there. He had seen two Greenfinches, which had arrived together during the spring.

The object of the following list is to afford in a concise manner some further information regarding each of the species observed; and also to give some idea of the various movements performed by them.

1. *TURDUS VISCIVORUS.* *Mistle-Thrush.*

Observed in some numbers at the lantern and around the ship on the early morning of Oct. 3rd, and again on the night of the 17th and in the early hours of the 18th, examples being captured on both occasions. One was flying high to the W. at 11 A.M. on the 18th.

2. *TURDUS MUSICUS.* *Song-Thrush.*

Numbers, probably emigrants, were flying around the ship between 2 and 4 A.M. on Sept. 18th and Oct. 3rd, some being killed on the latter date. Many were again present during the great night-movement of Oct. 17th-18th, when several were killed at the lantern.

3. *TURDUS MERULA.* *Blackbird.*

Was observed between 2 and 4 A.M. on Sept. 29th and

Oct. 3rd, along with other species, which were probably moving south. On the former date two were killed against the lantern, both immature males.

4. *SAXICOLA ŒNANTHE*. *Wheatear*.

This bird was observed on ten days. As an emigrant bound south, it was noticed singly, but numerous, during the day-time on Sept. 19th, 20th, 22nd, 27th, and Oct. 1st; and at the lantern, when possibly on a similar errand, on Sept. 22nd, 25th, 29th, and on Oct. 2nd and 3rd. On a few occasions single birds were seen flying to the S.E.; and immigrants, likewise singly, to the N.W. When attracted to the light, the bird was present in numbers, but probably these visitors arrived singly in this and other cases.

5. *RUTICILLA PHŒNICURUS*. *Redstart*.

Passed southwards on seven days between the 18th and 26th of September, and was numerous both by day and after dark. During the day-time it was observed to flit by singly but continuously; and at night several were at the lantern simultaneously, though they also may have appeared singly. On Sept. 25th a beautiful pinkish-buff variety with paler under surface and almost white wings, but with normally coloured lower back and tail, was killed at the lantern at 2 A.M., and proved to be a young male.

6. *SYLVIA CINEREA*. *Whitethroat*.

Participated in the great emigratory movement witnessed on the early morning of Sept. 25th, when a bird of the year was killed at the lantern.

7. *REGULUS CRISTATUS*. *Goldcrest*.

The first Goldcrests appeared on board singly during the forenoon of Sept. 23rd, others again on the 29th and on Oct. 1st, when they were moving southwards during the day-time. Numbers were flying in the rays and fluttering against the lantern during the early morning movements of Sept. 29th and Oct. 2nd and 3rd, and in the night of Oct. 17th-18th.

8. PHYLLOSCOPUS RUFUS. *Chiffchaff*.

At the lantern with other species, probably emigrants, on Oct. 3. One was captured at 3 A.M.

9. PHYLLOSCOPUS TROCHILUS. *Willow-Warbler*.

Was moving southwards during the day-time on Sept. 19th, 20th, and 22nd; and on the early morning of the 25th was flying around the light, when several examples were killed. Came on board freely, but singly, and on leaving went S.S.W.

10. HYPOLAIS ICTERINA. *Icterine Warbler*.

One came on board on the afternoon of Sept. 22nd, and allowed an inspection at close quarters before it quitted the ship for the coast of Kent.

11. MOTACILLA LUGUBRIS. *Pied Wagtail*.

A few were moving to the S.S.W. late in September, but the bird was chiefly observed migrating to the S.E. and S.S.E. between daylight and 10.30 A.M. on Oct. 1st, 7th, 14th, and 16th.

12. MOTACILLA FLAVA. *Blue-headed Yellow Wagtail*.

A fine adult male, in newly assumed winter plumage, was captured on the ship at 3.30 P.M. on Sept. 22nd, a great day for movements southward.

13. MOTACILLA RAIL. *Yellow Wagtail*.

One alighted on the deck at 1 P.M. on Sept. 22nd, remained a few moments, and then flew S.S.W. Many other species were moving southwards at the time, and probably other representatives of this species.

14. ANTHUS PRATENSIS. *Meadow-Pipit*.

Was observed passing on seventeen days. The main line of flight for the emigrants was from N.W. to S.E., and considerable numbers passed in that direction from Sept. 18th to Oct. 14th between 6 A.M. and noon. Smaller numbers were observed moving to the S.S.W. The immigrants came from both the E. and S.E., chiefly from the former quarter, and passed in numbers towards the Essex coast from Oct. 7th to 16th, the

chief flights being on the 8th, when some of the parties were forty strong. Was present during the night-movements of Oct. 3rd and 18th, but in small numbers; a few were killed.

15. ANTHUS TRIVIALIS. *Tree-Pipit.*

Was moving southwards during the day-time between Sept. 19th and 23rd, when several individuals came on board singly, some of which were captured. On the early morning of the 25th one was killed at the lantern along with other emigrant summer birds.

16. ANTHUS RICHARDI. *Richard's Pipit.*

A male in first plumage was captured at the lantern at 3 A.M. on Sept. 25th during a considerable movement of summer birds. Most unfortunately its tail was lost in the process of capture. Except as regards the bill, this species has a most remarkably lark-like appearance, and this, together with its very dark plumage and want of tail, tended to make it very difficult to determine, and I have to thank Mr. Hartert for its final identification.

17. ANTHUS OBSCURUS. *Rock-Pipit.*

Rock-Pipits, probably moving southwards, came on board on Sept. 23rd and Oct. 12th during the day-time, and one was captured at the lantern at 6.45 P.M. on Oct. 8th.

18. MUSCICAPA GRISOLA. *Spotted Flycatcher.*

Was flying around the ship, with a number of other emigrant species, from 1 to 4 A.M. on Sept. 25th, and two were killed at the lantern.

19. MUSCICAPA ATRICAPILLA. *Pied Flycatcher.*

Was first observed, and captured, on the night of Sept. 18th; and was moving southwards on the following day, when some alighted on the ship and proved their expertness in both finding and capturing insects, a "gamma" moth not being too much for them. On the 29th one was taken off the lantern at 3 A.M.

20. HIRUNDO RUSTICA. *Swallow.*

Swallows, old and young, were flying together to the S.S.W. on Sept. 26th and Oct. 2nd, 13th, 14th, and 16th; and to

the W. on Sept. 26th and Oct. 14th. The chief movements were on Oct. 13th and 14th, when parties, some of them one hundred strong, passed southwards, all flying low over the surface of the water. The earliest hour for these migrants was 7.45 A.M. and the latest 2 P.M.

21. CHELIDON URBICA. *House-Martin.*

The first and greatest movement of this bird was observed on Oct. 9th, when, after a decided fall in temperature, numbers were passing from N.W. to S.E., from 9 A.M. to 1 P.M., some of the parties containing as many as fifty individuals. Smaller numbers passed in the same direction on the 13th. On the 14th and 16th small flocks were moving from E. to W. in the forenoon. On the 16th several went N.W. during the morning.

22. COTILE RIPARIA. *Sand-Martin.*

On Oct. 15th the watch reported that he had seen twenty "Swallows" passing S.S.W. at 5.45 A.M., and of these seven alighted on the rail and rested for ten minutes. They were quite tame and allowed a close approach, and were described as being "brown above and white below."

23. PASSER MONTANUS. *Tree-Sparrow.*

From Sept. 23rd until Oct. 8th single birds or pairs came on board from the E. at intervals. On the last-named date the bird passed in considerable numbers going due W., and again on the 11th and 18th. On the 11th a small party was observed flying to the N.W. Was not seen at night. This species came on board more frequently than any other, and displayed many of the traits characteristic of its commoner cousin, being both noisy and familiar, and having the knack of making itself at home, even at sea. When aboard during high winds and heavy rain, the birds used to hustle each other in the scramble for the most sheltered places, and shewed much pugnacity.

24. FRINGILLA CŒLEBS. *Chaffinch.*

First seen on Sept. 29th, when an adult male came on board at 5 P.M. Not observed again until Oct. 8th, when

the great E. to W. flights set in, in all of which this bird participated largely, passing in flocks in the fore- and after-noon. On the morning of Oct. 15th it was passing in flocks to the S.S.W. as an emigrant and to the W. as an immigrant. Many were present during the great night-movement of Oct. 17th-18th.

25. STURNUS VULGARIS. *Starling*.

First observed on Sept. 24th, but down to Oct. 8th single birds only were seen, passing occasionally to both the S.S.W. and W. during the day-time. On Oct. 8th small parties passed from E. to W., and the initial movement in this direction was followed by others of considerable magnitude, which have already been treated of. Small numbers were occasionally observed emigrating from N.W. to S.E. during October. A solitary individual alone came under notice during the important nocturnal emigratory movements which took place in the latter half of September. The second occasion on which this species was observed at the lantern was during the great night-movement of Oct. 17th-18th, when thirty-two examples were killed or captured, all of them of the ordinary green-headed race. I secured only one specimen of the purple-headed form, and this came from the E. on the afternoon of Sept. 28th. I much regretted not being able to satisfactorily ascertain to what race the great numbers passing from E. to W. belonged, for not a single bird came aboard during these movements. It was impossible to say from what quarter the birds taken during the night-movement alluded to came. Some of my friends regard the purple-headed birds procured by me at the Eddystone as merely fresh-moulted specimens of the ordinary bird. If this be so, how is it that all the fresh-moulted examples obtained at the Kentish Knock at an almost identical date had green heads?

26. CORVUS MONEDULA. *Jackdaw*.

A few appeared from the E. at 4.25 P.M. on Oct. 17th, and others followed and were flying round the ship until 5 A.M. on the 18th. Two were captured.

27. *CORVUS FRUGILEGUS. Rook.*

The first Rooks appeared in small numbers from the E. at 5 P.M. on Oct. 17th, being preceded by a few Jackdaws. Several others made their appearance later, flying in the rays of light from 7 P.M. to 3 A.M. on the 18th, and an adult was captured at the lantern.

28. *ALAUDA ARVENSIS. Skylark.*

This species was more in evidence than any other, and its movements were of a singularly varied nature. As an emigrant it was observed moving to the S.S.W., S., and S.E.; and an immigrant to the W. and N.W. It participated largely in the southerly emigrations, both by day and night, during the latter half of September. It was also the most frequent visitor to the light, and was never absent from any of the night-movements. As with other species, its pronounced flights from E. to W. were not observed until Oct. 8th, but after that date it took a prominent part in all the great movements. It was present in numbers during the great night-migration of Oct. 17th-18th. Many were killed or captured at the lantern.

29. *TINNUNCULUS ALAUDARIUS. Kestrel.*

An adult male flew in the rays and approached the lantern continually between 8 P.M. of Sept. 18th and 1.30 A.M. on the 19th.

30. *PHALACROCORAX CARBO. Cormorant.*

Single birds were seen on Sept. 18th and 21st.

31. *SULA BASSANA. Gannet.*

Not unfrequently seen, moving chiefly southwards, and always in adult plumage. Did not fish in the vicinity of the lightship.

32. *CEDEMIA NIGRA. Common Scoter.*

First seen on Sept. 28th and frequently afterwards, usually flying towards the feeding-grounds under the shelter of the sands. Many seemed to arrive from the W. on Oct. 8th.

33. *ÆGIALITIS HIATICULA*. *Ringed Plover*.

This species was heard on five nights between the hours of 6.40 P.M. and 1.15 A.M. passing over the ship towards the W. or N.W., namely on Sept. 17th, 19th, 24th, 25th, and 29th. The unknown notes of other Limicolæ were on three of these occasions heard at the same time.

34. *VANELLUS VULGARIS*. *Lapwing*.

Between 9.45 P.M. and 11 P.M. on Sept. 30th, during brilliant moonlight, Lapwings were heard passing overhead from E. to W.

35. *PHALAROPUS HYPERBOREUS*. *Red-necked Phalarope*.

At midday on Sept. 30th one was seeking food on the water at some little distance from the ship.

36. *TRINGOIDES HYPOLEUCUS*. *Common Sandpiper*.

Heard passing southwards at 10.45 P.M. during the night-movement of Sept. 18th, when Redstarts and Pied Flycatchers were flying around the lantern.

37. *STERNA FLUVIATILIS*. *Common Tern*.

An immature example appeared and alighted on the rail during the forenoon of Sept. 29th.

38. *RISSA TRIDACTYLA*. *Kittiwake*.

Adults and young were common from Sept. 22nd onwards.

39. *LARUS ARGENTATUS*. *Herring-Gull*.

An adult seen on Oct. 15th was the only example of this species observed.

40. *LARUS FUSCUS*. *Lesser Black-backed Gull*.

Seen almost daily, but more numerous after Oct. 2nd.

41. *LARUS MARINUS*. *Greater Black-backed Gull*.

A few seen daily after Oct. 3rd. I never noticed any decided movements on the part of Gulls.

42. *STERCORARIUS POMATORHINUS*. *Pomatorhine Skua*.

From Oct. 7th was seen daily in attendance upon the Lesser Black-backed Gulls and Kittiwakes. Few mature birds were seen.

43. STERCORARIUS CREPIDATUS. *Richardson's Skua.*

Present daily from Sept. 24th onwards, chiefly engaged in bullying the Kittiwakes and sometimes the Lesser Black-backed Gulls. The dark form largely preponderated.

44. FULMARIUS GLACIALIS. *Fulmar.*

On Oct. 2nd at 5.45 P.M. one was observed flying southwards.

45. COLYMBUS SEPTENTRIONALIS. *Red-throated Diver.*

Both adults and young were seen not unfrequently, but always singly, fishing near the ship.

46. LOMVIA TROILE. *Common Guillemot.*

Not uncommon off the edge of the sand, where the shallow water probably affords good fishing-ground. These birds, and others seeking similar situations, were most numerous during strong westerly winds, when the east side of the sand afforded shelter and the possibility of obtaining food.

47. ALCA TORDA. *Razorbill.*

The same remarks apply to this species as to the last.

48. FRATERCULA ARCTICA. *Puffin.*

A single bird seen on the wing on Oct. 10th was the only record.

In conclusion, I wish again to tender to the Elder Brethren of the Trinity House my most sincere thanks for the great privileges which they so generously granted to me, and for the facilities placed at my service for carrying out the investigation. I wish also to thank Prof. Newton, Sir Michael Foster, and Captain Browne for much assistance and advice; and to record my obligations to Mr. E. Leborgne, the Officer-in-Charge of the lightship, and his excellent crew for many kindnesses and for services rendered, which contributed materially to my comfort and to any success that I may have achieved.